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# ATHYRIUM ERYTHROPODUM (WOODSIACEAE, PTERIDOPHYTA), A NEW PHILIPPINE RECORD

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SUMMARY

*Athyrium erythropodum* Hayata, which was previously thought to be endemic to Taiwan, has recently been discovered in the Philippines. This species has seldom been reported or described in the literature and if so has involved erroneous morphological description and diagnosis, which has caused confusion and partly erroneous taxonomic treatment. A detailed and revised diagnostic description of the species is provided in this report, along with illustrations showing its essential features.

***Key words***: *Athyrium erythropodum*, Philippines, new record, taxonomy.

## INTRODUCTION

The genus *Athyrium* is mainly distributed in temperate and tropical-subtropical regions of Asia. The delimitation of the genus *Athyrium* is not universally agreed, but modern taxonomists usually recognize *Deparia* (though split into several splinter-genera in mainland China), *Diplazium* and *Cornopteris* as distinct genera; the generic position of the closely related *Pseudocystopteris*, *Anisocampium* and *Kuniwatsukia* are still doubtful and they are generally excluded here, unless indicated otherwise. Although much further revision is still required, 117 *Athyrium* species have been recognized in China (Wang 1999), with the maximum species diversity of 51 species in Yunnan Province, SW China (Chu 2006) and the southeastern part of Tibet; 24 species, including one *Pseudocystopteris* species, are known from Taiwan (Yea-Chen Liu unpubl.); 35 species, including two *Pseudocystopteris* and one *Anisocampium* species, are known from Japan (Kato 1995); 45 species, including *Pseudocystopteris*, *Anisocampium* and *Kuniwatsukia* species, are known from the Indian subcontinent, excluding Sri Lanka (Fraser-Jenkins in prep. a); 8 species, including one *Anisocampium* species, are known from Sri Lanka (Fraser-Jenkins 2006); 16 species, including one *Kuniwatsukia* species, are known from Myanmar (Fraser-Jenkins in prep. b); 4 species, including one *Anisocampium* species, are known from Thailand (Tagawa & Iwatsuki 1988) and only 3 species are known from Malaya (Holttum 1968). 62 species of *Athyrium* (including

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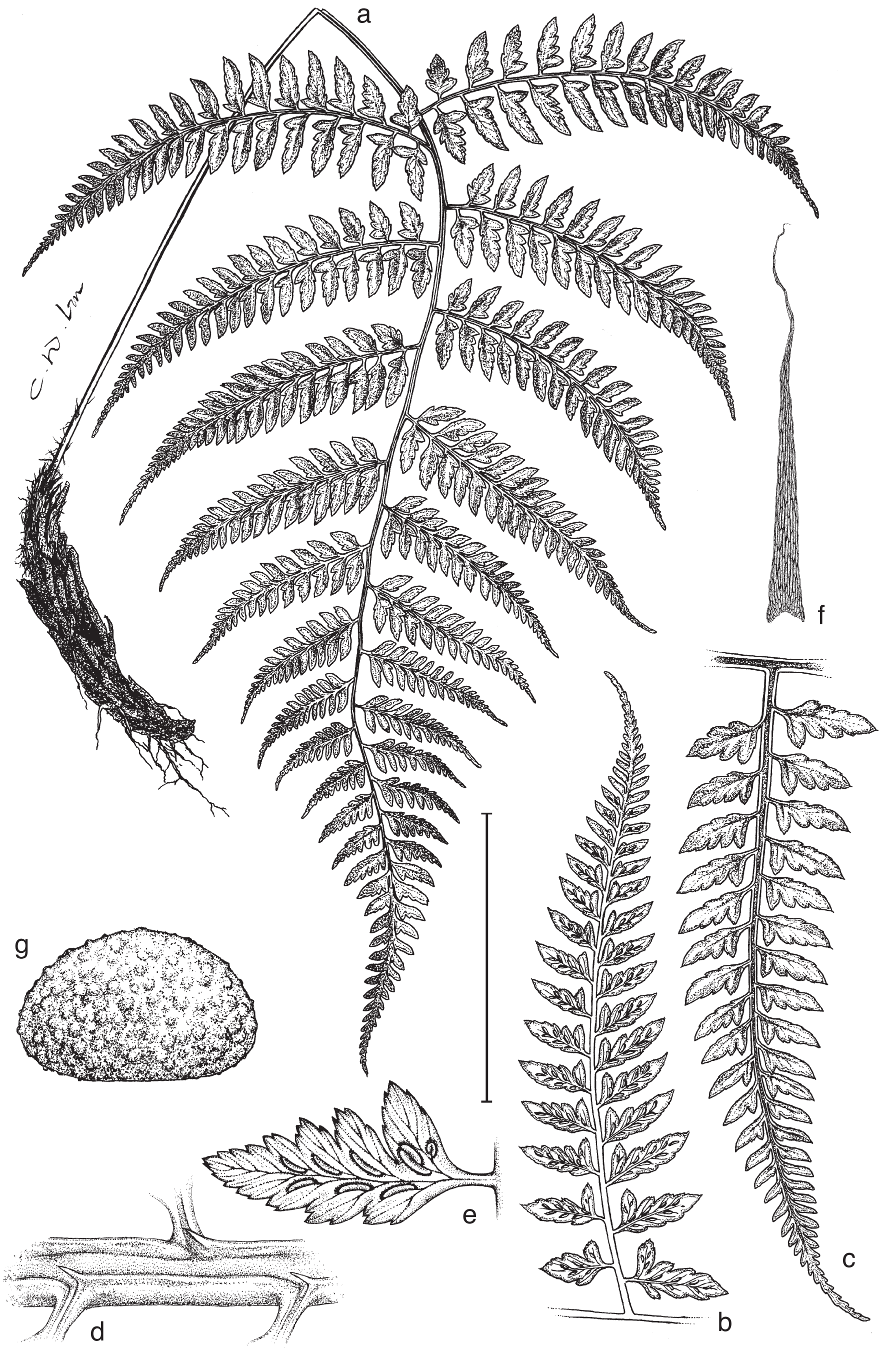



Fig. 1. *Athyrium erythropodum* Hayata. a. Habit; b. abaxial view of pinna; c. adaxial view of pinna; d. spines on adaxial surface of costa; e. sori; f. scale; g. spore. — Scale bars: a = 10 cm; b, c = 5 cm; d = 2 cm; e = 1 cm; f = 0.5 cm; g = 30 $\mu$m.

Table 1. Comparative morphology of *Athyrium erythropodum* and allied species.

| Morphological characters | *A. erythropodum* | *A. yakusimense* | *A. brevipinnulum* | *A. mearnsianum* |
|---|---|---|---|---|
| Scales at stipe base | black to glossy black | light brown | brown | black |
| Stipe and rachis indument | glabrous, except for unicellular hairs inside the adaxial groove | glabrous | glabrous | pubescent |
| Pinnule-apex | acute | acuminate | acute | obtuse |
| Pinnule-margin | sharply serrate | serrate | sharply serrate | crenate to shallowly serrate |
| Pinna-petiole | 3–10 mm | sessile or < 2 mm | sessile | shortly petiolate or sessile |
| Base of pinnule | stalk 2–3 mm | stalk 2–3 mm | sessile | sessile, partly adnate to costa |

species of *Anisocampium*, *Cornopteris*, *Deparia* and *Diplazium*) have been reported from the Philippines (Copeland 1960), but are in need of modern revision. Based on Copeland's descriptions and specimens seen in Philippine herbaria, we recognize at least 10 species of *Athyrium* s.s. in the Philippines, though further study of the holdings at BM, Kew and in herbaria in the United States is required.

*Athyrium erythropodum* Hayata (1914) was based on a collection from Mt Arisan (Alishan, Chiayi County), central Taiwan. This species occurs widely in Taiwan, growing on the semi-shaded floor of broad-leaved forests between 1500 and 2500 m altitude. But its identity has been confused because in the protologue (Hayata 1914) there is no mention of the costal spines present in this species. The Flora of Taiwan (DeVol & Kuo 1975, Shieh et al. 1994) therefore stated erroneously that it was "without spines on upper surface", which caused the misplacement of this species into section *Polystichoides* Ching & Y.T.Hsieh (see Wang 1997, 1999). This misunderstanding also caused the proposal of a new species, *A. sungkangense* C.M.Kuo, nom. nud. (Kuo 1997) based on a specimen of *A. erythropodum*.

*Athyrium erythropodum* was recently found by us on Mt Kitanglad, Mindanao Island in the Philippines, as a new country record. The first author also identified further specimens of it deposited under other names in the Philippine National Herbarium, Manila (PNH) and the Museum of Natural History Herbarium, University of the Philippines at Los Baños, Laguna (CAHUP). Here we present a comprehensive taxonomic description, distributional notes and comparison of its morphological characteristics with related species (Table 1).

**Athyrium erythropodum** Hayata — Fig. 1

*Athyrium erythropodum* Hayata (1914) 233, f. 163.
*Athyrium sungkangense* C.M. Kuo (1997) 155, nom. nud.

Evergreen, terrestrial fern. *Rhizome* short erect, thick. *Stipe* 8–20 cm long, bearing numerous lanceolate, black or glossy black scales in its lower half; stipe and rachis purple, seldom stramineous in the living state, glabrous. *Fronds* bipinnate to tripinnatifid, when

fully expanded 25–70 by 10–60 cm; widely deltate-lanceolate, basal pinnae opposite or subopposite, medial pairs alternate; rachis glabrous, with only a few unicellular hairs at the intersections of the adaxial surface grooves; *pinnae* anadromous at their base; 1.5–5 by 5–30 cm, ovate to broadly lanceolate, falcate, petiole 3–10 mm long, ascending, short spines present on the upper surface of the adaxial costae, becoming more prominent from the middle to the apex of the pinnae; lowest pinnae with elongated basiscopic pinnules; *pinnules* with petiole 2–3 mm, papyraceous to chartaceous, or herbaceous; margin serrate, apex acute, becoming pinnatifid in the longer basiscopic pinnules of lower pinnae, costules of the largest pinnules sometimes bearing spines. *Sori* close to the midrib, linear, J-shaped or somewhat hippocrepiform, indusia persistent. *Spores*, perispore rugose, granulate on the surface.

Habitat — Mossy forest understory, at 1500–2500 m altitude in Taiwan, but 1900–2450 m in the Philippines.

Distribution — Taiwan and the Philippines (Luzon and Mindanao).

Notes — Specimens of *A. erythropodum* deposited in Philippine herbaria had been misidentified as *A. mearnsianum* and *A. brevipinnulum* by several taxonomists. The type of *A. mearnsianum* has the pinnules with rounded apices, crenate or shallowly serrate margins and the pinnae either sessile or with short petioles. It is thus rather easy to distinguish it from *A. erythropodum*. The other name that was misapplied is *A. brevipinnulum* which has brown scales on the stipe-base and sessile pinnae and pinnules. The differences of this species from *A. erythropodum* are given in Table 1.

According to Kuo (1985) and Shieh et al. (1994), *A. erythropodum* is distributed in Taiwan and South Japan. However, *A. yakusimense* Tagawa, from South Japan, which was listed by Kuo as a synonym of *A. erythropodum*, is an independent species, readily distinguishable from it by its frond morphology: pinnae sessile or less than 2 mm long and with light brown scales. Thus until now *A. erythropodum* was only known to be endemic to Taiwan. As the range of *A. erythropodum* is now known to extend to the Philippines it is no longer to be treated as a Taiwanese endemic.

Specimens examined:

TAIWAN. *P.F. Lu 10143*, *12646*, *12776, 14064, B.J. Wang 14927*, *17830-965, 18402*, *18801-991*. All specimens deposited in the Herbarium of the Taiwan Forestry Research Institute (TAIF).

PHILIPPINES. *M.D. Sulit 2377* (PNH no. 5128), det. by E.B. Copeland as *A. mearnsianum* (Copel.) Alderw. – Mt Pauai, Luzon: *M.G. Price 411* (PNH no. 113526), det. by M.G. Price as *A. mearnsianum* (Copel.) Alderw., *M.G. Price 400* (CAHUP no. 15363), det. by M.G. Price as *A. mearnsianum* (Copel.) Alderw., det. by Tolentino as *A. brevipinnulum* Copel. – Mt Data, Luzon: *Y.C. Liu 9083* (Herbarium of Central Mindanao University; TAIF), *C.R. Fraser-Jenkins F.N. 73* (Herbarium of Central Mindanao University), Mt Kitanglad, Mindanao.

Specimens examined for comparison:

***Athyrium mearnsianum*** (Copel.) Alderw.: *Elmer 6543* (type of *A. mearnsianum*, photo in PNH), Mt Santo Tomas, Luzon, Philippines.

***Athyrium brevipinnulum*** Copel.: *M. Celestino & A. Castro O-119* (PNH no. 3974), det. by E.B. Copeland as *A. philippinense* Christ, det. by M.G. Price & J.F. Barcelona as *A. brevipinnulum* Copel., Mt Singakalsa, Luzon, Philippines.

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